Catalogue of American Amphibians and Reptiles.

MARTOF, BERNARD S. 1975. *Pseudotriton ruber.*

Pseudotriton ruber (Latreille)
Red salamander

Salamandra rubra Latreille *in* Sonnini and Latreille, 1801, 4:305. Type-locality "Les Etats Unis"; restricted to "vicinity of Philadelphia" (Schmidt, 1953). Type not known to exist, collected by A. M. F. J. Palisot de Beauvois.

Salamandra maculata J. Green, 1818:350. Type-locality not given. Type not known to exist. Collector unknown.

Salamandra subfusca J. Green, 1818:351. Type-locality not stated; given as "vicinity of Princeton, New Jersey" by Schmidt (1953). Type specimen and collector not given.

Salamandra rubriventris J. Green, 1818:353. Type-locality not specified but Green mentioned occurrence "in the neighborhood of Princeton," New Jersey. Type specimen and collector not given.

Proteus neocaersariensis J. Green, 1818:358. Type-locality "New Jersey," restricted to vicinity of Princeton (Schmidt, 1953). Type specimen and collector not given.

Molge rubra: Merrem, 1820:185. Substitute name.

Pseudotriton subfuscus: Tschudi, 1838:60. New combination.

Mycetoglossus subfuscus: Bonaparte, 1839: fasc. 26. New combination.

Batrachopsis subfuscus: Fitzinger, 1843:34. New combination.

Pelodytes subfuscus: Gistel, 1848:11. New combination.

Pseudotriton ruber: Baird, 1849:286. New combination.

Spelerpes rubra: Gray, 1850:45. New combination.

Bolitoglossa rubra: Duméril, Bibron, and Duméril, 1854:89. New combination.

Salamandra brevicauda: Wied, 1865:127. Substitute name.

Spelerpes ruber: Cope, 1869:107. Emendation.

Spelerpes sticticeps Baird *in* Cope, 1869:108. Nomen nudum.

Geotriton rubra: Garman, 1884:39. New combination.

Geotriton sticticeps: Garman, 1884:39. New combination.

Spelerpes ruber sticticeps Baird *in* Cope, 1889:178. Type-locality Georgia; restricted to Rabun County by Schmidt (1953: under synonymy of *Pseudotriton m. montanus*). Syntypes, U. S. Natl. Mus. 11475(2), received from Dr. W. L. Jones.

Spelerpes ruber schencki Brimley, 1912:139. Type-locality "Sunburst, Haywood County, North Carolina." Holotype, U. S. Natl. Museum 49679. Collected by C. S. Brimley, May 1912.

Spelerpes schencki: Brimley, 1915:200. New combination.

Eurycea rubra: Stejneger and Barbour, 1917:20. New combination.

Pseudotriton ruber ruber: Dunn, 1918:466. New combination.

Pseudotriton ruber schencki: Dunn, 1918:467. New combination.

Pseudotriton ruber nitidus Dunn, 1920:133. Type-locality, White Top Mountain, Virginia, 4000 ft. Holotype, Mus. Comparative Zoology (Harvard University) 5649, collected by E. R. Dunn.

Pseudotriton ruber vioscai Bishop, 1928:247. Type-locality, "10 miles west of Bogalusa, Louisiana." Holotype, U. S. Natl. Mus. 75057, collected April 1926 by P. Viosca, Jr.

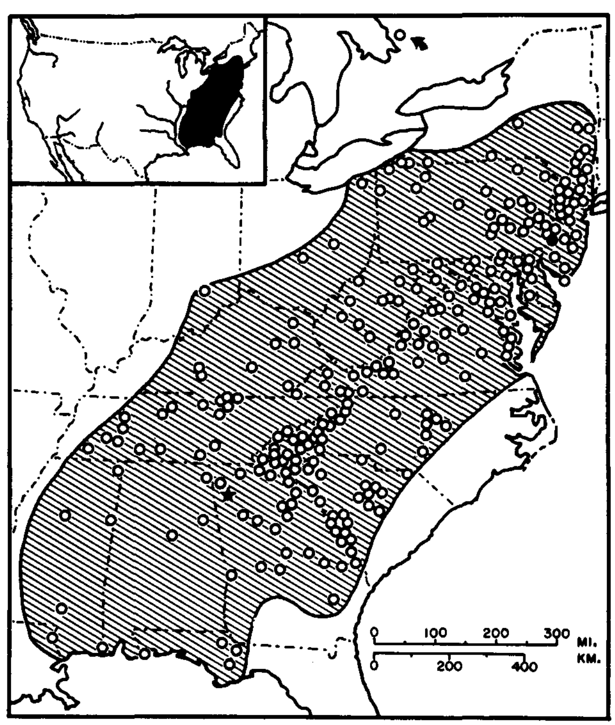
• CONTENT. Several subspecies have been described (see Schmidt, 1953; Conant, 1975) but I follow Bruce (1968) who did not use trinomials. See COMMENT.

• DEFINITION. A robust, short-tailed, yellow-eyed, reddish salamanders. Adults range from 97 to 180 mm in total length (Hardy and Mork, 1950). Tail length is about 80% of the snout-vent length and 38% of the total length. The dorsum of young adults is bright coral red to reddish orange, with numerous, irregularly rounded, black spots. The belly is salmon red with small, round, brown or black dots, but sometimes immaculate; undersurfaces of legs and tail are usually unspotted. The darkest part of the venter is between the forelegs just posterior to the gular folds. An irregular row of small black flecks may occur on the margin of each jaw. Old adults are darker, orange-brown or sometimes dull purplish-brown, with black spots tending to enlarge and fuse and be more abundant on the venter.

Hatchlings measure 11–13 mm snout-vent and 20–24 mm total length. The dorsal ground color of larvae is light brown to grayish-brown with small, scattered, black and white spots. The venter is yellowish-gray and immaculate. Larvae lack the spots on the margins of jaws as found in adults. Adult coloration is acquired after metamorphosis. At metamorphosis, larvae are 37–63 mm snout-vent and 65–110 cm total length.

Courtship occurs in June–September, spawning in October, and hatching in early December (Bruce, 1968). The larval period lasts 27 to 31 months and may be slightly shorter in the northern part of the geographic range. Males attain sexual maturity when about 4 years of age and measure about 54 mm in snout-vent length. Females oviposit at 5 years of age and are about 62 mm in snout-vent length. Females spawn annually, the average clutch includes about 69 eggs. Clutch size varies according to body size, increasing as growth occurs from about 50 to 100 eggs.

• DIAGNOSIS. The reddish color of this stocky, semiaquatic salamander makes identification easy. Most confusion is with *Gyrinophilus* and *P. montanus*. See Brandon (1967) and Martof (1975) for features separating *Gyrinophilus* and *Pseudotriton*. *P. ruber* is distinguished from *P. montanus* by its yellow iris, longer and less blunt snout, and irregular dorsal spots that tend to fuse with age. In contrast, *P. montanus* has brown eyes, a shorter and more blunt snout, and dorsal spots of older animals that tend to become obscure but do not fuse. The opercular apparatus of *P. ruber* is similar to that of other plethodontids, but that of *P. montanus* is unique (Monath, 1965): (1) its levator scapulae attaches to the operculum, rather than to the ear capsule and (2) its cucullaris major and pars oticus are incompletely divided whereas in other plethodontids they are discrete muscles. Numerous ecological and reproductive differences are given by Bruce (1968). *P. ruber* has a larger and more northern geographic range. It occurs throughout much of eastern North American whereas *P. montanus* inhabits mainly the southeastern states. *P. ruber* tolerates a wider range of ecological conditions and is more terrestrial. Like *P. montanus* it avoids large swift streams, but it inhabits both upland and lowland spring environs. In contrast, *P. montanus* is absent in mountain localities and occurs primarily in muddy bottomlands. The two species often cohabit areas where few competing plethodontid species occur. *P. ruber* is ecologically more similar to *Gyrinophilus* than is *P. montanus*. Their life histories differ greatly: *P. ruber* courts and spawns about 2 months sooner each year than does *P. montanus*. Its larval period is about a year longer and sexual



MAP. Solid circle marks type locality; hollow circles indicate other localities. Star marks a Pleistocene fossil locality.

maturity is attained about a year later. Unlike *P. montanus*, female *P. ruber* have a regular annual spawning cycle and lay smaller clutches. Metamorphosing *P. ruber* quickly develop adult coloration, but *P. montanus* may require a year to do so.

The larvae of *P. ruber* have a stout head and body, are darker, distinctly mottled or streaked, and usually lack spots. In contrast, those of *P. montanus* are more slender, have a lighter ground color which is at most only faintly streaked, and have distinct, scattered small spots (dots or flecks). Hatchlings and very small larvae are difficult to identify specifically.

• DESCRIPTIONS. Bishop (1943) provides the most detailed information. Other general sources are Bishop (1941), Conant (1975), Cope (1889), Dunn (1926). The following descriptions are also useful: Life history—Bishop (1925), Bruce (1968, 1969, 1972, 1974), Dunn (1915), Gordon (1966); larvae—Bell (1956), Eaton (1956); courtship—Organ and Organ (1968); spermatophore—Organ and Lowenthal (1963); skull—Joubert (1961), Martof and Rose (1962); sound transmitting apparatus —Hilton (1949); hyobranchial apparatus—Piatt (1935), Hilton (1947); appendicular regeneration—Hilton (1948); costal grooves between adpressed limbs—Grobman (1943).

• ILLUSTRATIONS. Excellent color illustrations appear in Barbour (1971, pl. XV), Cochran (1961, pl. 18), Conant (1975, pl. 42), and Leviton (1972:32). Several good black and white photographs are available: Adults—Bishop (1925:388), Brimley (1912, pl. VII), Carr and Goin (1955, pl. 34), Grobman (1941: 179), Huheey and Stupka (1967 illus. 19); adults, larvae and eggs—Bishop (1941:261, 262 and 1943:391, 394, 397, 400). For a photomicrograph of a pigmented leucocyte (monocyte) see Fukui and Mitsui (1965:293) and for one of a section of a spermatophore Organ and Lowenthal (1963:665). Fine line drawings include: Egg, hatchlings, larvae—Bishop (1941:267); spermatophores—Organ and Lowenthal (1963:661); courtship —Organ and Organ (1968:218, 219); skull—Martof and Rose (1962:728); tongue and teeth—Bishop (1943:348); oral mucous membranes—Elkan (1958:351); comparative dental pattern and growth—Regal (1966:396); vomer—Wake (1966: 21); hyobranchial apparatus—Hilton (1947:192, larva, 193 adult); appendicular regeneration—Hilton (1948:145).

• DISTRIBUTION. *Pseudotriton ruber* occurs in eastern North America. It has been collected in Canada near Parry Sound, Ontario (McCoy and Durden, 1965) but the main part of the range extends from southern New York westward to Indiana and southward east of the Mississippi River to the Gulf Coast. It is absent from most of the Coastal Plain of North and South Carolina, the lower Atlantic Coastal Plain of Georgia, and all of Florida except the western panhandle. The larvae inhabit the still waters of springs and associated small streams. Adults are particularly abundant in leaf accumulations in spring-fed brooks and in crevices and burrows in the loose, moist soil nearby. Also they occur in a variety of terrestrial habitats: depressions and shallow burrows under logs, boards, stones and leaves. See PERTINENT LITERATURE for references on distribution.

• FOSSIL RECORD. Presacral vertebrae of *Pseudotriton ruber* occur in Pleistocene deposits near Rome, Georgia (Holman, 1967). Fossil vertebrae are readily identifiable because the neural processes of *P. ruber* are higher than those of *P. montanus* (Holman, 1967).

• PERTINENT LITERATURE. The best study of the biology of this species is by Bruce (1968). Other pertinent literature includes: Life history—Bell (1956), Bishop (1925, 1941, 1943), Bruce (1972), Dunn (1915, 1926); courtship and comparative descriptions of spermatophores—Organ and Organ (1968), Organ and Lowenthal (1963); comparative fecundity—Bruce (1969); eggs —Bishop (1925, 1941), Brimley (1923), Bruce (1969), Fowler (1962), Wood and Witt (1962); larvae—Bruce (1968, 1972), Eaton (1956), Gordon (1966), Valentine and Dennis (1964); induction of post-metamorphic coloration—Noble and Richards (1932); chemical composition of pigment—Obika and Bagnara (1964); mimicry—Brodie and Howard (1972); rotation of eye (stabilization of visual field)—Milne and Milne (1965); food—Axtell and Axtell (1948), Bishop (1925, 1941), Carr (1940), Surface (1913); feeding apparatus—Regal (1966); comparative osteology—Martof and Rose (1962), Wake (1966); critical maximum temperature—Zweifel (1957); geographic variation—Bishop (1928, 1943), Brimley (1912), Cope (1889), Dunn (1920, 1926), Goin (1939), Grobman (1941), Hardy and Mork (1950), Hoffman (1953), Neill (1948), Rubenstein (1969); important distributional records—Bishop (1941, 1943), Boyd and Vickers (1963), Brimley (1912, 1915), Conant (1945), Dunn (1920, 1926), N. Green (1948), Holman (1967), Huheey and Stupka (1967), McCoy and Durden (1965), Mittleman (1946), Sinclair (1950), Wilson (1973).

• ETYMOLOGY. *Ruber* is derived from Latin and means "red".

COMMENT

Knowledge of several aspects of the biology of this species is scant or absent: date and site of oviposition, description of eggs and early embryology, parental care and survival of eggs. It is especially interesting that only slight variation in life history occurs among widely separated populations (Bruce, 1968) and that larvae from the Appalachian Mountains are virtually indistinguishable from those in the Coastal Plain of southern Mississippi (Valentine and Dennis, 1964). Until a comprehensive study of geographic variation in life history, body proportions, ontogenetic changes and pigmentation is completed, subspecific designations are inappropriate. In fact, there is still much confusion about the identification of the two species of *Pseudotriton*. All geographically peripheral specimens, especially those from the southern Appalachians, should be carefully re-examined.

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